



PROPOSED EARLY ACTIONS TO MITIGATE CLIMATE CHANGE IN CALIFORNIA



April 20, 2007



GLOSSARY OF TERMS AND ACRONYMS

AB 32 – Assembly Bill 32, the Global Warming Solutions Act of 2006

CAT – Climate Action Team, a committee of multiple state agencies led by the Secretary of Cal/EPA

CO₂ – carbon dioxide; a byproduct of fossil fuel combustion, cement production, and other natural processes

C/E – cost effectiveness, the dollars expended per ton of greenhouse gases reduced

CNG – compressed natural gas

E-10, E-85 – blends of gasoline and ethanol consisting of 10% ethanol (E-10) or 85% ethanol (E-85)

GHG – greenhouse gas or gases; defined in AB 32 as carbon dioxide, methane, nitrous oxide, Hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride; also known as “the Kyoto six”

GWP – global warming potential, the relative warming of a greenhouse gas as compared to carbon dioxide which has a GWP of 1.0.

HFC – Hydrofluorocarbons; a class of compounds typically used in air conditioning systems and as propellants

H&SC – (the California) Health and Safety Code

LCFS – Low Carbon Fuel Standard

MMTCO₂E – million metric tons (of) carbon dioxide equivalent (gases)

MVAC – motor vehicle air conditioning (systems)

NMOC – non-methane organic compounds, volatile hydrocarbons that react with nitrogen oxides in the atmosphere to form ozone; also referred to as ozone precursors

NO_x – oxides of nitrogen, a combustion product that reacts with volatile hydrocarbons in the atmosphere to form ozone; NO_x is also a precursor to certain forms of particulate matter such as ammonium nitrate and to highly irritating substances such as nitric acid mist or droplets

PFC – perfluorocarbons, a chemical mostly used in the semi-conductor industry

PM – particulate matter

SF₆ – sulfur hexafluoride; a chemical emitted from various industrial processes

EARLY ACTIONS TO MITIGATE CLIMATE CHANGE IN CALIFORNIA

1. SUMMARY

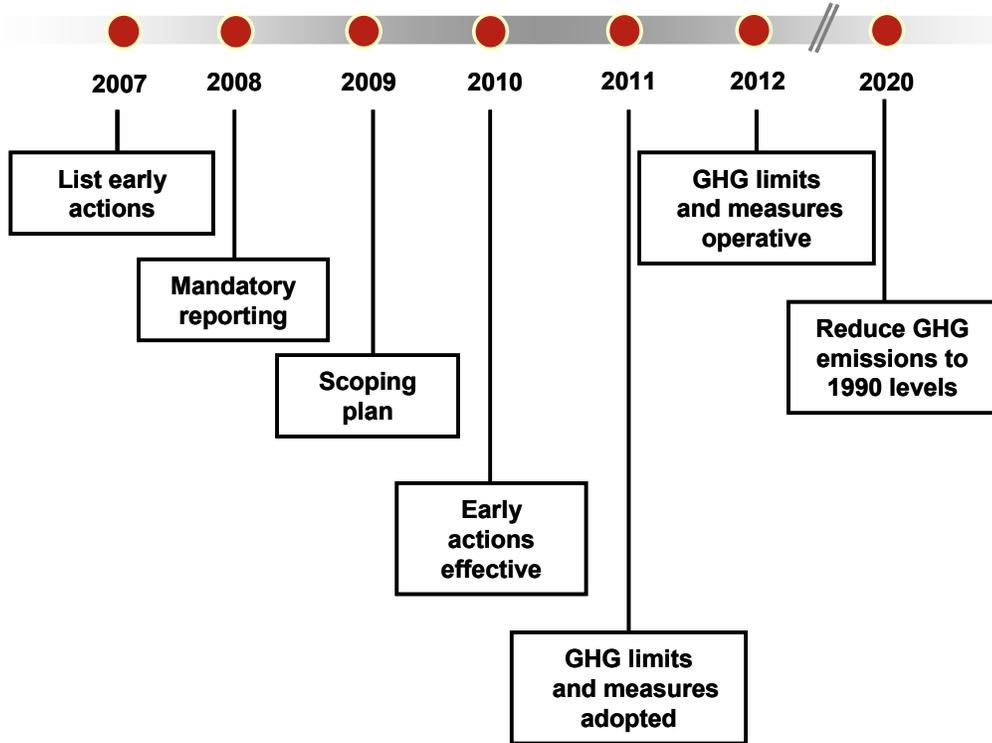
This document describes the Air Resources Board (ARB or Board) staff's analysis and recommendations for discrete early action measures to reduce global warming emissions. These measures will become part of the State's comprehensive strategy for achieving greenhouse gas (GHG) reductions under Assembly Bill 32, the California Global Warming Solutions Act of 2006 (AB 32 of the Act).

AB 32 creates a comprehensive, multi-year program to reduce GHG emissions in California, with the overall goal of restoring emissions to 1990 levels by the year 2020. (see Figure 1.) The Act recognizes that such an ambitious effort requires careful planning and a comprehensive strategy. By January 1, 2009 the Board must design and adopt an overall plan to reduce GHG emissions to 1990 levels. The Board has until January 1, 2011 to adopt the necessary regulations to implement that plan. Implementation begins no later than January 1, 2012 and the emissions reduction target must be fully achieved by January 1, 2020. As part of this comprehensive effort, the Board is empowered to use traditional command and control methods and to adopt and implement market-based compliance mechanisms provided certain criteria are met.

Alongside this deliberate approach, AB 32 recognizes that immediate progress in reducing greenhouse gas emissions can and should be made. Accordingly, the Act requires ARB to identify a list of "discrete early action greenhouse gas reduction measures" by June 30, 2007 (Health and Safety Code section 38560(a)). Once on the list, these measures are to be developed into regulatory proposals, adopted by the Board, and made enforceable by January 1, 2010. This schedule is very accelerated compared to most regulations developed by the Board.

The ARB received more than 70 suggestions from stakeholders for early action measures. Those within ARB purview were carefully reviewed by staff. Those under the jurisdiction of other agencies were forwarded to the appropriate Climate Action Team member(s) for consideration. The suggestions covered a wide range of ideas including a low carbon fuel standard (LCFS), replacement of hydrofluorocarbons (HFCs) in fire suppression systems, a green ship incentive program, waste management methods, water management methods, and renewable energy initiatives. Some of the proposed strategies require new legislation to implement, some require subsidies, some are already being developed, and some require additional effort to evaluate and quantify. Two summary tables of stakeholder suggestions are attached (A – Stakeholder Suggestions under ARB Jurisdiction and B – Stakeholder Suggestions for the CAT Forwarded from the ARB). The ARB staff appreciates all of the suggestions that have been received so far and looks forward to additional public comments in response to this document.

**Figure 1
Comprehensive Multiyear Program
Established by AB 32**



Staff is proposing that ARB actively pursue 36 separate measures during calendar years 2007, 2008 and 2009 (see Figure 2 and Tables 1, 2 and 3 below).

Three new GHG-only regulations are proposed to meet the narrow legal definition of “discrete early action greenhouse gas reduction measures” in Section 38560.5 of the Health and Safety Code (see Table 1 - Group 1). These include the Governor’s Low Carbon Fuel Standard, reduction of refrigerant losses from motor vehicle air conditioning maintenance, and increased methane capture from landfills. These actions are estimated to reduce GHG emissions between 13 and 26 MMTCO₂E annually by 2020 relative to projected levels. If approved for listing by the Governing Board, these measures will be brought to hearing in the next 12 to 18 months and take legal effect by January 1, 2010.

ARB is *initiating* work on another 23 GHG emission reduction measures in the 2007-2009 time period, with rulemaking to occur as soon as possible where applicable (see Table 2 - Group 2). These GHG measures were drawn from three separate sources. Some were identified in the March 2006 Climate Action Team Report and are already underway. This group also includes strategies ARB staff has identified since March 2006 – such as cooler automobile paints and tire inflation requirements – that could be developed relatively quickly and produce significant GHG reductions. The Group 2

measures also reflect stakeholder input. Group 2 measures are expected to yield at least 20 MMTCO₂E of reductions by 2020, with reductions for several measures still to be quantified.

Finally, ARB staff has identified 10 conventional air pollution control measures that are scheduled for rulemaking in the 2007-2009 period (Table 3 – Group 3). These control measures are aimed at criteria and toxic air pollutants, but will have concurrent climate co-benefits through reductions in CO₂ or non-Kyoto pollutants (i.e., diesel particulate matter, other light-absorbing compounds and/or ozone precursors) that contribute to global warming. These measures were drawn from ARB's annual rulemaking calendar, ARB's Diesel Risk Reduction Plan, the Goods Movement Emissions Reduction Plan, and the State Implementation Plan. Group 3 reductions in terms of MMTCO₂E are still being quantified.

The Group 1, 2 and 3 measures will reduce GHG emissions between 33-46 MMTCO₂E by 2020 relative to projected levels. Existing ARB regulations will contribute an additional 30 MMTCO₂E (e.g., AB 1493). These estimates *exclude* the benefits from reducing diesel particulate matter, ozone precursors and other pollutants since the CO₂ equivalent effects are yet to be determined. Together, these measures will make a substantial contribution to the overall 2020 statewide emission reduction goal of approximately 174 MMTCO₂E.

ARB is not the only state agency undertaking early action measures. The Climate Action Team has been hard at work identifying additional GHG reduction strategies that can be accomplished or initiated in the 2007-2009 period. Those actions are briefly summarized in Section 6 of this report and will be described further in a separate Cal/EPA document.

AB 32 requires that all GHG reduction measures adopted and implemented by the Air Resources Board be technologically feasible and cost-effective. The law also requires that GHG measures have neither negative impacts on conventional pollutant controls nor any disproportionate socio-economic effects (among other criteria). ARB staff is making a presumption, based on currently best available information, that all of the measures it is proposing to pursue will meet all of the legal requirements of AB 32. If additional information or analysis reveals that a particular measure cannot meet one or more of these requirements, it will not be put into effect. The actual design or features of each measure may also change based on public comments and/or what is learned during the regulatory development process.

Figure 2
Early Actions to Reduce Greenhouse Gas Emissions

ARB ADOPTED REGULATIONS

Vehicle Climate Change Standards
Criteria and Air Toxic Controls

**EARLY ACTIONS TO REDUCE GHGS
CALENDAR YEARS 2007, 2008, 2009**

ARB MEASURES

GROUP 1
Discrete Early Action Measures

GROUP 2
Additional Greenhouse Gas
Reduction Strategies

GROUP 3
Criteria and Air Toxic
Control Measures

**CLIMATE ACTION TEAM
MEASURES**

(See separate Cal/EPA report)

Table 1
Group 1 – ARB Discrete Early Action Measures
Per Health & Safety Code Section 38560.5

Number	Sector	Description	2020 Reductions (MMT CO ₂ E)
1-1	Transportation	Low Carbon Fuel Standard (LCFS)	10-20
1-2	Transportation	Reduction of HFC-134a emissions from non-professional servicing of motor vehicle air conditioning systems (MVACs)	1-2
1-3	Waste	Improved landfill methane capture	2-4
Group 1 Total Reductions			13-26

Notes on Table 1: Measure 1-1 subsumes two prior measures from the March 2006 Climate Action Plan: “Alternative Fuels – Biodiesel Blends” and “Alternative Fuels – Ethanol in Gasoline” that were jointly estimated to achieve 4 MMTCO₂E by 2020.

Table 2
Group 2 – Additional GHG Reduction Measures
Underway or to be Initiated by ARB in 2007-2009 Period

Number	Sector	Description	2020 Reductions (MMT CO ₂ E)
2-1	Agriculture	Manure management (methane digester protocol)	1
2-2	Agriculture	Electrification of stationary agricultural engines	0.1
2-3	Commercial	Specifications for commercial refrigeration	>7.3
2-4	Commercial	Reduction of perfluorocarbons (PFCs) from the semiconductor industry	0.5
2-5	Commercial	Reduction of hydrofluorocarbons (HFCs) from foam production/installation including extruded polystyrene and block foam	TBD
2-6	Education	Guidance/protocols for local governments to facilitate GHG emission reductions	TBD
2-7	Education	Guidance/protocols for businesses to facilitate GHG reductions	TBD
2-8	Electricity	Detection, repair, and recycling equipment for sulfur hexafluoride (SF ₆)	0.7
2-9	Energy Efficiency	Light-covered paving, cool roofs and shade trees	TBD
2-10	Fire Suppression	Replacement of high global warming potential (GWP) gases used in fire protection systems with alternate chemical(s)	0.1
2-11	Forestry	Forestry protocol	TBD
2-12	Oil & Gas	Reduce venting/leaks from oil and gas systems	1
2-13	Transportation	Strengthen light-duty vehicle standards	4

Table 2, continued			
Number	Sector	Description	2020 Reductions (MMT CO₂E)
2-14	Transportation	Heavy-duty vehicle emission reductions, efficiency improvements	3
2-15	Transportation	Cool automobile paints	1.2 to 2.0
2-16	Transportation	Port Electrification	0.5
2-17	Transportation	Transportation refrigeration, electric standby	0.1
2-18	Transportation	Enforce federal ban on HFC release during service/dismantling of MVACs	0.1
2-19	Transportation	Truck stop electrification with incentives for truckers	TBD
2-20	Transportation	Tire inflation program	TBD
2-21	Transportation	Promote telework policies/incentives	TBD
2-22	Transportation	Require low GWP refrigerants for new MVACs	TBD
2-23	Transportation	Add AC leak tightness test and repair to Smog Check	TBD
Group 2 Total Reductions			19.6 to 20.4

Notes on Table 2: Some of the estimated 2020 reductions listed reflect new information and/or refinements since the March 2006 Climate Action Report. Some measures from that Report have been disaggregated and others have been combined based on ARB staff's preliminary assessment of how best to proceed. Particulate matter related benefits are not included in the right-hand column since those have yet to be quantified.

**Table 3
Group 3 – ARB Air Pollution Controls for 2007-2009 Adoption
With Potential GHG Reductions or Other Climate Co-Benefits**

Number	Sector	Description	Hearing Date
3-1	Transportation	Diesel - Commercial harbor craft rule	2007
3-2	Transportation	Diesel – Privately owned on-road trucks	2008
3-3	Transportation	Diesel – Vessel speed reductions	2007 or 2008
3-4	Transportation	Diesel – Offroad equipment (non-agricultural)	2009
3-5	Transportation	Diesel – Port trucks	2007
3-6	Transportation	Diesel – Vessel main engine fuel specifications	2008
3-7	Transportation	Standards for off-cycle driving conditions	2007
3-8	Fuels	Gasoline dispenser hose replacement	2008
3-9	Fuels	Portable outboard marine tanks	2007 or 2008
3-10	Fuels	Evaporative standards for aboveground tanks	2007

Notes on Table 3: The CO₂-equivalent emission reductions from these measures are not identified because the science to characterize the net climate effects of particulate matter and ozone precursors is still developing. There is reasonable expectation that these measures will yield some reductions of GHG emissions.

2. RECOGNITION OF VOLUNTARY EARLY EMISSION REDUCTIONS

AB 32 requires ARB to ensure that entities that have voluntarily reduced their greenhouse gas emissions prior to the implementation of GHG emission limits and GHG reduction measures receive “appropriate credit” for early voluntary reductions (see Health & Safety Code section 38562(b) (3)).

To fulfill this requirement, the ARB staff is working on methods to recognize voluntary early actions by industry, government and individuals. Staff believes that the leadership shown by many businesses and local governments needs to be acknowledged and supported. The first step in this effort is to quantify and document voluntary emission reductions that rise beyond “business as usual,” but this is not trivial. This verification also needs to be based on methods that demonstrate real, permanent and surplus (relative to regulatory requirements) GHG reductions. To get started, ARB intends to officially review and approve sector-specific and project-specific emission calculation protocols as they become available. Some reporting protocols have already been published by the California Climate Action Registry and many more are in the pipeline. ARB is also working on interim guidance for quantification, documentation and verification of greenhouse gas emission reductions. Eventually, ARB will define the process for translating voluntary emission reductions into creditable reductions consistent with the broader AB 32 implementation strategy.

ARB intends to adopt rules for awarding GHG reduction credit and the process for submitting credit requests. This regulation will be developed with full opportunity for public input, starting in mid-2007 with a public workshop. Staff are already considering the criteria for receiving credit, amounts of credit given, and uses to which credits may be applied. Issues to be explored include what types of actions count (e.g., in-state only or out-of-state), how far back in time voluntary actions will be considered, the level of documentation required, and criteria for determining additionality and permanence. The parameters of the program will evolve during the regulatory development process as the ARB gathers information about voluntary measures through workshops, public comment, and hearings. While the ARB cannot provide precise details about how voluntary reductions will be credited, the staff is committed to ensuring that all parties who voluntarily reduce their GHG emissions beyond business as usual receive appropriate credit as required by AB 32.

3. PREVIOUSLY ADOPTED ARB REGULATIONS

Existing ARB regulations are expected to yield significant GHG reductions between now and 2020. These include the greenhouse gas emission standards for motor vehicles (per AB 1493, Pavley) as well as several diesel risk reduction measures. Regarding the latter, the greatest GHG reductions are expected to come from ARB’s anti-idling controls and from the electrification of various diesel engines such as agricultural pumps. More detail on these measures is provided below.

3.1 VEHICLE CLIMATE CHANGE STANDARDS (AB 1493)

AB 1493, Pavley, Chapter 200, Statutes of 2002, required ARB to achieve the maximum feasible and cost-effective reduction of greenhouse gas emissions from passenger vehicles and light-duty trucks. These vehicle standards were adopted by ARB in September 2004 and are scheduled to take effect in the 2009 model year. Staff estimates an emissions savings of approximately one MMTCO₂E by 2010 and 30 MMTCO₂E by 2020. This analysis demonstrated that operating cost savings will more than offset the incremental costs of improved technologies, resulting in consumer savings of \$5 billion annually by 2020. ARB's request for a federal waiver to implement its motor vehicle regulations is currently pending before the U.S. Environmental Protection Agency. Concurrently, ARB is defending its legal authority to impose such standards in federal court.

AB 32 requires – should the federal waiver be denied or should ARB lose the lawsuit brought against it by the automakers – that ARB adopt alternative regulations to control mobile sources of greenhouse gas emissions to achieve greater or equivalent reductions (see Health & Safety Code section 38590).

3.2 DIESEL RISK REDUCTION MEASURES

ARB has adopted numerous regulations to reduce diesel particulate matter (PM) since 2001. In addition to the direct health benefits associated with these rules, these regulations will produce important climate protection benefits. Black carbon is a major component of diesel PM and has a significant net warming effect. In addition, some of the diesel rules result in fleet modernization, fuel switching, and/or greater fuel savings, which further promote greenhouse gas emission reductions. Twenty diesel risk reduction measures have been adopted between October 2001 and November 2006, including rules for low-sulfur diesel fuels, diesel truck operational idling limits, transit bus rules, garbage truck rules, school bus replacements and retrofits, stationary diesel engine rules, agricultural engine rules, portable engine rules and border truck inspection protocols.

The scientific community has not yet determined the precise global warming potential (GWP) for diesel PM as compared to carbon dioxide. Nevertheless, reductions in PM emissions are expected to provide important near-term climate benefits. Preliminary estimates of the 100-year horizon global warming potential of diesel PM range from 500 to 1200 (relative to CO₂). This means that 1 kilogram of diesel PM contributes much more to global warming than 1 kilogram of CO₂ over the 100-year timeframe typically used to evaluate climate change impacts. This is the case even though diesel PM has a much shorter atmospheric lifetime than CO₂ (weeks versus hundreds of years) and has some components that cause cooling rather than warming of the atmosphere. Thus a comprehensive program to address climate change will need to address a suite of pollutants—CO₂ as well as other global warming pollutants. California is well positioned

for that eventuality, given its aggressive control programs for criteria and toxic air pollutants.

ARB has identified and committed to additional measures that will reduce emissions of diesel PM, as shown in Table 3. These measures are not included in Group 1 (early action measures per Health and Safety Code Section 38560.5) because, as discussed previously, diesel PM does not currently have a well-defined GWP and thus is not readily incorporated into the AB 32 reduction framework. In addition, although some of the diesel PM reduction measures will have CO₂ co-benefits (particularly those that reduce total fuel combustion) it may prove to be the case that they would most effectively be implemented by entities other than the ARB. Other diesel PM reduction measures are expected to result in a small CO₂ increase. Thus, ARB determined that these measures are not appropriate for inclusion on the Group 1 list. Nonetheless, they are expected to result in a real-world climate benefits in the aggregate and should be recognized as part of ARB's overall effort.

Ozone and its precursors (oxides of nitrogen and volatile hydrocarbons) are also considered to be climate changing gases. Accordingly, ARB's efforts to control ozone should have a beneficial climate effect. However, the science to quantify the net impact of these pollutants on the global climate is still evolving and definitive estimates are not possible at this time. Instead, only qualitative assessments can be made.

4. DISCRETE EARLY ACTION MEASURES

AB 32 requires that on or before June 30, 2007, ARB shall publish and make available to the public a list of discrete early action greenhouse gas emission reduction measures that can be adopted and made enforceable before January 1, 2010. The law further requires that such measures achieve the maximum technologically feasible and cost-effective reductions in GHGs from (the pertinent) sources or categories of sources, in furtherance of achieving the statewide greenhouse gas emissions limit for 2020 (see Health & Safety Code section 38560.5.). Elsewhere in the statute, AB 32 requires that every GHG reduction measure adopted by ARB satisfy additional criteria such as no relaxation in conventional air pollutant controls. ARB staff used the latter requirements as screening criteria.

4.1 STRATEGY IDENTIFICATION

Potential Measures - To come up with a preliminary list of discrete early action measures, ARB staff considered many information sources including:

- the Climate Action Team (CAT) Report,
- stakeholder suggestions,
- strategies identified at ARB's International Symposium on Near-Term Solutions for Climate Change Mitigation held on March 5-7, 2007,
- ideas developed by ARB staff, and

- various sources of information such as the Carbon Disclosure Project, the California Climate Action Registry, projects certified by the United Nations Clean Development Mechanism, and compilations of cost-effective mitigation strategies identified by international sources including the European Commission.

Screening Criteria - To select specific measures for listing as “discrete early action measures,” ARB staff applied the screening criteria below. These criteria reflect the language in AB 32 as well as additional practical considerations. ARB staff believes a common and objective basis is important for selecting early action measures. The screening criteria were:

- Whether the strategy can be adopted by ARB in calendar year 2009 or earlier.
- Whether the strategy can be legally effective by January 1, 2010.
- Whether the strategy relies on readily available mature technologies or options that have already been successfully demonstrated at an acceptable cost.
- Whether the potential lifecycle GHG emission reductions are of sufficient magnitude to warrant the resources required to adopt and implement a regulation.
- Whether the strategy can be developed and implemented with available resources.
- The potential for adverse impacts on criteria or toxic emissions.
- The potential for disproportionate impacts on low-income communities or other disadvantaged sectors.
- The potential for disproportionate impacts on small businesses.
- Significant loss of benefits due to leakage.
- Coordination opportunities with related actions that may have been taken or are planned by other entities including local agencies, the U.S. EPA, and international agencies such as the European Commission.

The most important considerations to ARB staff were the potential GHG reductions achievable by each measure and the likelihood of its being made enforceable by January 1, 2010. To the extent possible, staff considered the maturity of the enabling technology and the estimated cost per avoided ton of CO₂ equivalent emissions. GHG reduction strategies that could potentially interfere with conventional air pollution controls or have disproportionate effects were non-starters.

Technical Feasibility and Cost Effectiveness - As noted above, AB 32 requires that each GHG reduction measure adopted by ARB be technologically feasible and cost-effective.

“Technologically feasible” is not defined in the statute. The ARB’s assessment of technological feasibility for GHG emission reduction strategies is expected to be similar to that which has been applied to traditional regulations: 1) a given mitigation strategy has been successfully demonstrated in the same or very similar application; 2) a mitigation strategy has been demonstrated in a related application such that technology transfer is plausible; or 3) with further advances and a sufficiently ample phase-in period, existing technologies will offer an effective mitigation strategy.

The ARB interprets “cost-effectiveness” (C/E) consistent with the statutory definition in AB 32 as the number of dollars expended per metric ton of CO₂E gases reduced. The potential cost-effectiveness of the measures assessed for early actions varies widely, both in magnitude and in terms of certainty. When fully developed, each strategy is expected to meet a yet-to-be-determined cost-effectiveness threshold that the Board must establish as necessary to achieve the overall goals of AB 32 and that is equitable relative to the GHG reduction achieved. It is premature to establish a C/E ceiling at this time. The staff’s recommendation of a proposed early action measure simply indicates the staff’s presumption that the selected strategy is or can be made to be a cost-effective regulatory proposal for reducing GHGs.

4.2 DESCRIPTION OF SELECTED STRATEGIES

This section describes the proposed discrete early action measures in greater detail. These measures were selected because they fully met the following criteria:

- The measure can be enforceable by January 1, 2010.
- The anticipated GHG emission reductions are of sufficient magnitude to warrant the resources needed to design and adopt the measure.
- The measure is likely to be technically feasible and cost-effective.
- The ARB is the appropriate agency to implement the measure.
- The measure is unlikely to result in adverse impacts on criteria or toxic emissions, or disproportionate impacts on low-income communities or on small businesses.

Low Carbon Fuel Standard - Will require fuel providers (including producers, importers, refiners, and blenders) to ensure that the mix of fuels they sell in California meets, on average, a declining standard for greenhouse gas emissions that result from the use of transportation fuel.

Transportation accounts for over 40 percent of greenhouse gas emissions in California. Reducing GHG emissions from this source category is vital in achieving the goals of the Global Warming Solutions Act of 2006. Understanding this challenge, the Governor signed Executive Order S-01-07 on January 18, 2007, which established the Low Carbon Fuel Standard (LCFS) in California. Amongst other directives, Executive Order S-01-07 requires ARB to consider the LCFS as part of its list of discrete early action items for AB 32.

The LCFS as an early action would establish a “carbon content” standard for transportation fuels linked to the fuel’s impact on GHG emissions. The goal is to reduce the “carbon intensity” of California’s vehicle fuel by at least 10 percent by 2020. Carbon intensity refers to GHG emissions per unit of energy, in units such as grams of CO₂E per British Thermal Unit, used to power a vehicle.

Currently, California relies on petroleum-based fuels for 96 percent of its transportation fuel needs. Greenhouse gas emissions result from each step of the petroleum refining process, from pumping crude oil out of the ground through vehicle tailpipe emissions. The LCFS will be measured on a lifecycle basis (sometimes called “well-to-wheel” in

reference to petroleum products) to capture all emissions from fuel consumption and upstream processes. To reduce greenhouse gas emissions, suppliers will need to bring lower carbon intensity fuels to the market. Lower-carbon fuels include biofuels such as ethanol and biodiesel, as well as hydrogen, electricity, compressed natural gas, liquefied petroleum gas and biogas.

Restrictions on High Global Warming Potential (GWP) Refrigerants - Would restrict the use of high GWP refrigerants for non-professional recharging of leaky automotive air conditioning systems.

Hydrofluorocarbons (HFCs) are a class of compounds that include 10 individual substances. They are used as substitutes for chlorofluorocarbons (CFC), which were identified as ozone depleting substances under the Montreal Protocol. Major applications of HFCs are in refrigeration, air conditioning, foam, solvent, aerosol propellants and fire protection. Although they may be suitable replacements for CFCs in terms of stratospheric ozone depletion, HFCs are potent GHGs. Specifically, HFC-134a, used nearly universally in motor vehicle air conditioning systems, has a GWP of 1300 as compared to CO₂ (with a GWP of 1). The focus of this strategy is to eliminate the unnecessary releases of HFC-134a when cans are used to recharge leaky MVACS. However, realizing that HFC-134a cans for MVACS is not the only burden on the environment, the proper repair of leaky MVACS during professional servicing and the mitigation of HFC-134a impacts from other applications and products are also under evaluation by ARB staff as part of the Group 2 strategies.

The California GHG emissions inventory suggests that high-GWP GHGs constitute about 3.5 percent of the total CO₂ equivalent emissions in 2002. Reducing some of these compounds is the goal of a suite of strategies in the March 2006 Climate Action Plan. Specifically, the Climate Action Plan identified five HFC reduction measures that have total potential reductions of approximately 9 MMTCO₂E in 2020. These measures are interrelated and include:

- Mitigation of impacts of refrigerant available at retail for servicing MVACS (as the proposed early action discussed in this section).
- Requirement of low-GWP refrigerants in new MVACS.
- Improvements in stationary refrigeration and air conditioning (RAC).
- Potential inclusion of a refrigerant leak test and repair in California's Smog Check Program.
- Enforcement of the federal ban on release of HFCs during servicing and dismantling of MVACS.

The discrete early action measure recommended here addresses one of the five HFC reduction measures. ARB staff is working on the remaining measures, but needs additional time and information to bring them to completion. In addition, the ARB is investigating strategies targeted at the reduction of other classes of high-GWP GHGs, namely very high-GWP ozone depleting substances, which may have significant contributions to global warming and that present opportunities for mitigation.

Landfill Methane Capture - Would set statewide standards for the installation and performance of active gas collection/control systems at municipal solid waste (MSW) landfills.

Biological decomposition of organic waste contained in MSW landfills leads to the production of landfill gas, consisting primarily of carbon dioxide, methane, and trace amounts of non-methane organic compounds (NMOC). Methane is a potent greenhouse gas having approximately 21 times the GWP of CO₂. NMOCs are precursors to ozone formation, can be toxic, and some are odorous. In some instances, the gas may migrate laterally underground and accumulate in nearby structures on or near the MSW landfill, posing as a potential fire or explosive hazard. If uncontrolled or inadequately controlled, landfill gas eventually migrates to the surface where it could present an odor problem or adversely impact air quality. Currently, the California Energy Commission estimates GHG emissions from California's MSW landfills to be approximately 8.4 MMTCO₂E.

MSW landfills are regulated by local air district rules who impose federal New Source Performance Standards and Emission Guidelines (CFR Part 60 Subparts WWW and Cc) and the National Emission Standards for Hazardous Air Pollutants (40 CFR Part 63 Subpart AAAA). The federal regulations require emission controls when an MSW landfill reaches a design capacity of 2.75 million tons or greater and an NMOC emission rate of 55 tons per year or more. The federal regulations apply primarily to large MSW landfills. There are no consistent statewide standards for smaller and other uncontrolled landfills. The proposed early action measure addresses this issue.

The California Integrated Waste Management Board (CIWMB) estimates that about 94 percent of the total waste-in-place in California is contained in landfills having active gas collection systems in which the gas is collected and routed to a control device, such as a flare or engine where the methane is combusted. About 41 landfills were identified by CIWMB as not having emissions controls. As part of the Climate Action Team's strategy for reducing GHG emissions from MSW landfills CIWMB proposed: 1) the installation of emission control systems, 2) increasing energy recovery from landfill methane, and 3) increasing landfill methane capture efficiencies. Based on the implementation of these three strategies, CIWMB estimated total GHG emissions reductions of 1.0 MMTCO₂E for 2010 and 3.0 MMTCO₂E for 2020.

Of the three landfill methane capture strategies mentioned above, the requirement for installing emission control systems at uncontrolled landfills is being considered for a discrete early action. In addition, ARB staff is also proposing to expand the scope of this early action to include efficiency and emissions control resulting in total reductions on the order of 2 to 4 MMTCO₂E by 2020. In developing the control measures, ARB staff will work closely with CIWMB staff. CIWMB is developing a guidance document for landfill operators and regulators that will recommend technologies and best management practices for improving landfill design, construction, operation and closure for the purpose of reducing GHG emissions.

The other two strategies will require more time to implement and additional investigation to resolve issues. To encourage the installation of landfill gas-to-energy (LFGTE) projects, permitting, criteria pollutant offset, and landfill gas pretreatment issues must first be addressed. In addition, the California Energy Commission is funding a study to improve overall estimation of GHG emissions and reductions from MSW landfills. This study is not expected to be completed until 2009. ARB staff is closely monitoring the progress of the study and participating on the study's technical advisory committee.

4.3 PROCESS FOR GOING FORWARD

AB 32 sets two milestones for discrete early action measures. First, the Board must approve a list of such measures by July 1, 2007. Second, the measures must be legally enforceable by January 1, 2010 (see Health & Safety Code section 38560.5). The ARB staff has already conducted one public workshop on proposed discrete early action measures. A second public workshop is scheduled for April 23, 2007 in Sacramento. A final staff report responding to the last round of public comments will be released on May 22, 2007. The public hearing before ARB's Governing Board is scheduled for June 20-21, 2007 in Los Angeles (location TBD). Assuming the Board approves the proposed list, staff will immediately begin the rule development process. Staff anticipates bringing all three measures to the Board for adoption toward the end of calendar year 2008. That will ensure sufficient time for processing through the Office of Administrative Law so that the rules can be legally enforceable by January 1, 2010.

5. OTHER GHG MEASURES TO BE UNDERTAKEN IN THE 2007-2009 PERIOD

Discrete early action measures are only one part of ARB's efforts to reduce greenhouse gases and other climate changing pollutants in the near term. ARB staff is working on additional GHG regulations to be adopted in late 2009 or early 2010, which will just miss the January 1, 2010 enforceability date for "discrete early action measures" in AB 32. In addition, ARB staff are working on several non-regulatory measures such as guidance documents and protocols to spur the public, local government and businesses into positive action. These activities have been categorized as "Group 2" measures.

Group 2 strategies include the remaining ARB GHG reduction actions proposed in the Climate Action Team report that were not ready for adoption as discrete early actions, stakeholders suggestions, and new ideas identified by ARB staff. Examples of strategies in this category include port electrification, and the use of cool materials to increase vehicle and building energy efficiency. Staff anticipates bringing these measures to the Board for adoption within the next three years. Some may begin implementation as rules prior to January 2010 but many will not. Further examination by ARB staff over the next year is expected to yield additional viable candidates for regulatory adoption and possible candidates for non-regulatory actions that the ARB can promote and encourage.

6. THE ROLE OF TRADITIONAL AIR POLLUTION CONTROLS

A number of stakeholders have commented that ARB's conventional air pollution controls should also be considered early action measures, even though they do not address the specific greenhouse gases identified in AB 32. In support of this position, stakeholders point to extensive scientific evidence that black carbon and ozone have climate changing effects. Staff is aware of that information and agrees that conventional air pollution controls make an important contribution to climate protection. Accordingly, staff has listed all the pertinent ARB rulemakings for criteria and toxic air contaminants scheduled for public hearings in 2007, 2008 and 2009 as "Group 3" measures.

Group 3 consists of regulations being developed primarily for criteria or toxic pollutant control purposes, but that are also expected to have climate co-benefits. Such regulations fall into two categories. The first category includes measures under ARB's Diesel Risk Reduction Plan. Examples include proposed regulations for port trucks and proposed requirements for the use of cleaner fuels in ocean-going vessel main engines. The second category includes strategies expected to provide GHG co-benefits by reducing conventional pollutants that may also contribute to atmospheric warming.

7. EARLY ACTIONS BY OTHER STATE AGENCIES

Many other State agencies are taking proactive steps to mitigate greenhouse gas emissions. For example, the Climate Action Team report identifies near term GHG strategies for the Department of Food and Agriculture (e.g., enteric fermentation), the Public Utilities Commission (e.g., California solar initiative), the Resources Agency and Energy Commission (e.g., municipal utility combined heat and power), the Department of Transportation (e.g., congestion reduction measures), and many others. In addition, stakeholders have submitted many more suggestions for potential strategies. The proposals outside of ARB's jurisdiction were referred by ARB staff to the appropriate Climate Action Team member or members for their consideration. A summary of those suggestions and their current status are appended to this document as Attachment B. Cal/EPA is currently assembling a separate document on early actions to be undertaken by Climate Action Team members.

8. EDUCATION EFFORTS

Many stakeholders emphasized the need for expanded education and outreach efforts regarding how the public can reduce the GHGs associated with everyday activities. ARB agrees that well crafted public education efforts have the potential to achieve real world emission reductions. The results of such efforts can be difficult to quantify, and at this point ARB is not prepared to list them as "reduction measures" in the context of this report. The ARB staff will, however, actively pursue a number of public education efforts in coordination with CalEPA, the Climate Action Team, and other interested parties. Such efforts will include establishing a product labeling program and identifying best practices for consumers, developing California-specific GHG footprint calculators, and exploring the development of an eco-driver training program.

Attachment A

STAKEHOLDER SUGGESTIONS UNDER ARB JURISDICTION

ID No.	Description of Strategy	Status
A-1	Low carbon fuel standard	Assigned to Group 1
A-2	Reduction in emissions of HFC-134a from non-professional servicing of motor vehicle air conditioning systems	Assigned to Group 1
A-3	Replacement of HFCs in fire protection systems	Assigned to Group 2
A-4	Heavy-duty efficiency improvements: energy efficient tires, improved aerodynamics	Assigned to Group 2
A-5	Transportation refrigeration units - electric standby	Assigned to Group 2
A-6	Require that large truck stops provide electric infrastructure, and provide incentives for truck operators to use zero emitting technologies	Assigned to Group 2
A-7	Proposed regulation to establish allowable speeds for ocean-going vessels defined in coastal waters	Assigned to Group 3
A-8	Proposed requirements for the use of cleaner fuels in ocean-going vessel main	Assigned to Group 3
A-9	Principles of a CO2 Market : a) make the market comprehensive instead of sectoral; b) auction permits instead of giving them away to corporations; c) preserve the public trust aspect of the resource by including a per capita equity component	Deferred to Scoping Plan
A-10	Study public trust allocation of CO2 permits	Deferred to Scoping Plan
A-11	Fix price for carbon (i.e., carbon tax) and/or include high GWP GHGs in trading	Deferred to Scoping Plan
A-12	Wafflemat system for concrete slab foundations	Deferred to Scoping Plan
A-13	Change the price signal - suggest a vehicle license fee/car tax corresponding to fuel efficiency	Deferred to Scoping Plan
A-14	Demonstrate use of shoreside generators as bridge to electrical hook-up	Deferred to Scoping Plan
A-15	Green ship incentive program	Deferred to Scoping Plan
A-16	Adoption of requirements for low carbon fuel vehicle sales and low carbon fuel infrastructure for transportation fuels and light-duty vehicles	Deferred to Scoping Plan
A-17	Reduction in emissions of HFC-134a from non-professional servicing of motor vehicle air conditioning systems by setting up a financial incentive for consumers to recycle the partially-discharged refrigerant cans	Deferred to Scoping Plan
A-18	Adopt requirements and incentives for truck owners and operators to adopt "SmartWay" technology for medium and heavy-duty trucks/goods movement measures	Deferred to Scoping Plan
A-19	Anti-idling requirement for cargo handling equipment at ports	Deferred to Scoping Plan
A-20	Require the electrification of airport ground support equipment	Deferred to Scoping Plan
A-21	Require the electrification of construction equipment at urban sites	Deferred to Scoping Plan
A-22	Adopt a regulation and/or incentive program to take advantage of emerging hybrid-electric technology for medium duty delivery trucks	Deferred to Scoping Plan
A-23	Requirements for alternative fuel vehicle sales, fuel distribution	Deferred to Scoping Plan
A-24	Ethanol imports from Brazil (and bio-diesel imports), could be part of the E10/85	Deferred to Scoping Plan

Attachment B

STAKEHOLDER SUGGESTIONS FOR THE CAT FORWARDED FROM THE ARB

ID No.	Applicable Sector(s)	Description of Proposed Early Action or Strategy	Department Assigned
B-1	Cement	Relatively inexpensive energy savings measures with short pay back times for cement industry (e.g., encourage the use of cleaner blends of cement that are less carbon-intensive)	BTH
B-2	Cement	Explore a greenhouse gas and mercury emission performance standard for cement facilities equivalent to the level achievable through conversion from coal to natural gas (22% 1.2MMTCo ₂ E and 30-45% 1200-1800 lbs Hg per year)	BTH
B-3	Commercial	Renewable diesel fuel plant	CEC
B-4	Commercial	Efficiency standards – the CEC should adopt water efficiency standards for irrigation equipment and for new residential and nonresidential construction	CEC
B-5	Commercial	Increase building insulation standards/insulation improvements (potential incentives to solve market failures)	CEC
B-6	Commercial	Application of leak detection system for locating fugitive methane leakage from gas transmission pipes and storage device, and landfills etc.	CIWMB
B-7	Commercial	HVAC I/M to improve efficiencies of existing and new commercial buildings	CEC
B-8	Commercial	A goal to bring curbside recycling to every household (single and multi-family) by 2010	CIWMB
B-9	Commercial	A goal to require commercial enterprises to obtain recycling services by 2010	CIWMB
B-10	Commercial	Material specific disposal limits to require all Californians to limit their disposal of recyclable materials such as cardboard, paper, or construction and demolition debris, regardless of whether it is collected by a refuse company or self-hauled to the landfill	CIWMB
B-11	Commercial	Embedded Energy - The CPUC should allow investor-owned energy utilities to invest in water use efficiency measures as a way to reduce the associated energy use	CEC
B-12	Commercial	Mandatory fluorescent light bulbs (e.g., Australia)	CEC
B-13	Commercial	Ban of sales of incandescent light bulbs	CEC
B-14	Commercial	Ice Bear peak power demand shifting technology for A/C	CEC
B-15	Commercial	Free provision and installation of solar panels for residential and commercial buildings	CEC
B-16	Commercial	Biogas (anaerobic digestion) technology: capture off-gases from covered lagoons (e.g., dairies), plug flow, or complete mix operations for in-site power generation purpose	CEC
B-17	Commercial	Increase average thermostat temperature to reduce A/C use	CEC
B-18	Commercial	Urban Certification - The Department of Water Resources (DWR) should establish an urban certification program to assure compliance with urban water conservation Best Management Practices (BMPs) contained in the Memorandum of Understanding (MOU) regarding urban water conservation in California	DWR
B-19	Commercial	Water measurement - The Department of Water Resources should create a water use database and a system for reporting water deliveries and diversions	DWR
B-20	Electricity	CEC adoption of regulations to implement Senate Bill 1368's greenhouse gas emissions performance standard for new long-term commitments to baseload generation	CEC
B-21	Electricity	Renewable power	CEC/CPUC
B-22	Electricity	Better incentives for renewable energy	CEC/CPUC
B-23	Electricity	Incentivize community choice aggregation with high RPS	CPUC
B-27	Electricity	From net-metering to solar compensation	CEC
B-28	Electricity	Increased demand-side-management (DSM) for power	CEC/CPUC

Attachment B

STAKEHOLDER SUGGESTIONS FOR THE CAT FORWARDED FROM THE ARB

ID No.	Applicable Sector(s)	Description of Proposed Early Action or Strategy	Department Assigned
B-29	Electricity	Streamline/ratebase transmission investments from renewable power rich areas (Tehachapi, Imperial Valley, etc...)	CEC/CPUC
B-30	Forest	Forests (encourage reforestation): promote sustainable forestry, ban clear cutting, enforce higher restocking ratios, and incentivize better forest practices	CalFire
B-31	Forest	Thin National Forests to encourage growth and increase carbon uptake by fewer trees	CalFire
B-32	Forest	a) Begin the process for reviewing and adopting the Registry's forest protocols b) Recognize the early actions of Registry members c) Coordinate with other agencies with jurisdiction over forest and land-based activities to develop guidelines and accounting methods for achieving reductions from the forest sector	CalFire/ARB
B-33	Industry	Reduced fouling and improved efficiencies of large water-cooled systems (chemical + biocide)	CEC
B-34	Multiple	Water and climate - encourage local actions	DWR
B-35	Multiple	State support for local efforts	ARB
B-36	Multiple	Streamline reporting for small facilities - suggest a stepped approach to include small emitters in CA Climate Action Registry	ARB
B-37	Multiple	Help local agencies avoid "Death by Success"	UNDER REVIEW BY THE CAT
B-38	Multiple	GHGs in General Plans and CEQA	ARB/Resources
B-39	Other	Technology grant program for reducing GHGs	UNDER REVIEW BY THE CAT
B-40	Residential	Standards for stand by electric use (for appliances that are plugged in, using less electricity)	CEC
B-41	Residential	Water conservation	DWR/CEC/CPUC
B-42	Residential	Water supply planning	DWR
B-43	Residential	Water re-use	DWR/SWRCB
B-44	Transportation	Improve transportation system efficiency	BTH/CalTrans
B-45	Transportation	Increased public transport	BTH
B-46	Transportation	Transportation pricing policies	CEC
B-47	Transportation	CEC adoption of minimum tire efficiency standards pursuant to AB 844 for transportation fuels and light-duty vehicles	CEC
B-48	Transportation	Entry taxes for drivers in congested areas (e.g. London; must be coupled with good public transport)	CEC/ARB

* - As of March 2, 2007. The majority of the suggestions were provided at the January 22, 2007 ARB Public Workshop on Discrete Early Actions.

** - CalTrans = California Department of Transportation; CEC = California Energy Commission; CIWMB = California Integrated Waste Management Board; CPUC = California Public Utilities Commission; CDFFP = California Department of Forestry and Fire Protection; DWR = Department of Water Resources; DTSC = Department of Toxic Substances Control; OEHHA = Office of Environmental Health Hazard Assessment; WRCB = Water Resources Control Board